

## **WHAT IS CLAIMED:**

1. A method for fabricating a semiconductor device, comprising the step of:  
depositing a fluorine-containing organic film having a relative dielectric constant of 4 or less on a semiconductor substrate using a material gas containing  $C_4F_6$  as a main component.
2. A method for fabricating a semiconductor device, comprising the steps of:  
dry-etching an insulating film on a semiconductor substrate using an etching gas containing  $C_4F_6$  as a main component; and  
depositing a fluorine-containing organic film having a relative dielectric constant of 4 or less on the semiconductor substrate using a material gas containing  $C_4F_6$  as a main component,  
wherein the step of dry-etching an insulating film and the step of depositing a fluorine-containing organic film are performed in a same plasma processing apparatus.
3. The method for fabricating a semiconductor device of Claim 2, wherein the step of dry-etching an insulating film and the step of depositing a fluorine-containing organic film are performed in a same reactor chamber of the same plasma processing apparatus.
4. The method for fabricating a semiconductor device of Claim 2, wherein the step of dry-etching an insulating film includes the step of forming a contact hole through the insulating film,  
the step of depositing a fluorine-containing organic film includes the step of filling at least a bottom portion of the contact hole with the fluorine-containing organic film, and  
after the step of depositing a fluorine-containing organic film, the method further comprises the step of:  
forming a resist pattern having an opening for wiring groove formation on the insulating film;

forming a wiring groove on the insulating film by dry-etching the insulating film using the resist pattern as a mask:

removing the resist pattern and the fluorine-containing organic film existing in the contact hole; and

filling the contact hole and the wiring groove with a metal film to form a contact and a metal interconnection made of the metal film.

5. The method for fabricating a semiconductor device of Claim 2, wherein the insulating film is made of a silicon oxide film.

6. A method for fabricating a semiconductor device comprising the steps of:

depositing a metal film on a semiconductor substrate;

forming a mask pattern made of a resist film or an insulating film on the metal film;

dry-etching the metal film using the mask pattern to form a plurality of metal interconnections made of the metal film; and

depositing a fluorine-containing organic film having a relative dielectric constant of 4 or less as an interlayer insulating film between the plurality of metal interconnections and on top surfaces of the metal interconnections using a material gas containing  $C_4F_6$  as a main component.

7. The method for fabricating a semiconductor device of Claim 6, wherein the step of forming a mask pattern includes the steps of:

depositing the insulating film on the metal film;

forming a resist pattern on the insulating film; and

dry-etching the insulating film using the resist pattern to form the mask pattern, and

the step of dry-etching the insulating film and the step of depositing a fluorine-containing organic film are performed in a same reactor chamber of a same plasma processing apparatus.

8. The method for fabricating a semiconductor device of Claim 7, wherein the step of dry-etching the metal film is performed in the same reactor chamber.

9. The method for fabricating a semiconductor device of Claim 8, wherein an inner wall of the reactor chamber includes an aluminum layer and a ceramic layer or an Alumite-treated aluminum layer.

10. The method for fabricating a semiconductor device of Claim 7, wherein the insulating film is made of a silicon oxide film.